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ABSTRACT

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ED 373 709

Title:

A Cognitive Model of Journal Writing

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Abstract

This paper presents a cognitive model of journal-writing as a metacognitive tool in understanding stories in an introduction to literature course.

The methodology was primarily qualitative. Data included students' journals and class comments; surveys of the helpfulness of journal writing ; individual learner characteristics (e.g., reading ability, field dependence/ independence, academic record, course grade, and confidence in journal-writing ability); and case studies of five students. Findings indicated that (a) students generally viewed journal writing as a flexible cognitive tool which helped them construct the meaning of stories, and (b) writing journals scaffolds (supports) students in attending to details, asking questions, and answering their own questions. Although high-ability readers tended to engage in different cognitive activities than lower-ability readers, frequencies of questions and self-explanations were not related to story difficulty. Students' valuations of journal writing were not significantly related to measures of achievement (course grades, semester grade-point averages, or cumulative grade-point averages).

Moreover, journal writing is a very dynamic process; no single cognitive model can describe journal writing either within or across students. A two-part model was developed to describe the process: (a) factors which influence journal writing (task difficulty, individual learner characteristics, teacher expectations, student strategies, external resources, overt activities), and (b) components of journal writing (establishing a goal, constructing the textbase, constructing the situation model, predicting outcomes, identifying significant elements, reflecting on meaning, and assembling the schema).

Recommendations for research are included.

Introduction

Journal writing has been used as an instructional/learning strategy in a wide variety of educational settings from first-grade mathematics (Wason-Ellam, 1987) to teacher education (Bean & Zulich, 1989). The type of journals which are the focus of this paper are more precisely called "academic journals," which are "usually based on responses to assigned readings or topics presented in class, and are most often evaluated not for their style or control of formal writing abilities but for their reflection of students' learning and thinking" (Anson & Beach, 1990, p. 3).

Although there is a strong theoretical base for the use of academic journals as an instructional/learning strategy, there is little research to inform instructional applications. The literature on metacognition (e.g., Flavell, 1979; Corno & Mandinach, 1983) supports the use of strategies which promote comprehension monitoring. Schema theory (e.g., Anderson, Reynolds, Schallert, & Goetz, 1977; Norman, Gentner, & Stevens, 1976; Rumelhart & Ortony, 1977) leads us to expect that journals will reflect both assimilation and accommodation. At times students will impose schemata on new information, sometimes doing "violence...to the data contained in the text" (Anderson et al., 1977, 371). At other times, students will tune schemata or create new cognitive structures (Norman, Gentner, & Stevens, 1976). More recent perspectives imply that journals will reflect a dynamic process of schema assembly, with dynamic networks rather than stored mental structures (e.g., Clancey, 1992; Spiro, Coulson, Feltovich, & Anderson, 1988). These views are consonant with theory and research on conceptual change (e.g., West & Pines, 1985; Champagne, Gunstone, & Klopfer, 1985a & b; Novak, 1985; Strike & Posner, 1985; Wittrock, 1985) and with constructivism, with its emphasis on active rather than passive learners (e.g., Duffy & Jonassen, 1992; Jonassen, 1991; Wittrock, 1974).

Unfortunately, much of the limited research on the use of journals has failed to establish meaningful goals, to provide challenging tasks, or to control for individual

differences. For example, Anson and Beach (1990) used length of journals as the sole grading criterion and Hynd and Chase (1990) failed to control for the difficulty level of textual materials.

Purpose

The broad purpose of this predominantly qualitative study was to construct a cognitive model of journal writing in an ecologically valid setting, where learner characteristics and task difficulty varied. This paper focuses on three of the research questions (for discussion of the complete study, see Cole, 1992).

- What strategies do learners use when they are encouraged to use journals as a cognitive tool (Derry, 1990), constructing intermediate stages of knowledge (Bereiter & Scardamalia, 1992)? • How are these strategies related to variables such as content difficulty, reading ability, and cognitive style? For example, research on individual differences (Jonassen & Grabowski, 1993) implies that field dependent (FD) students will want more direction than field independent students in writing journals and that FD journals will reflect difficulty in attending to details. Miyake and Norman (1979) found that frequency of oral questions about text-editing tasks in a computer program (a well-defined domain) was related to expertise.
- Does this findi[illegible]xtend to questions and comments in students' journals in an Introduction to Litera[illegible]ure course, which is an ill-defined domain (Spiro & Jehng, 1990; see also, Spiro, Coulson, Feltovich, & Anderson, 1988)?

Methods

Setting and Subjects

Qualitative and quantitative methods were used to study journal writing in an in tact group of 14 students in a night section of a Introduction to Literature at a large urban community college in the midwest. The class met 75 minutes twice a week for 15 weeks. The basic instructional approach combined whole-group discussion with elements of the cognitive-apprenticeship model (Collins, Brown, & Newman, 1989). On the first night of class, I told students that I would be collecting information that would help me improve instruction for them as well as for future students. The course applied toward the humanities requirement for the AA/AS degrees. Course objectives emphasized defining and applying literary concepts, applying rules and heur-istics, and problem-solving. During the previous seven years, I had used similar journal-writing strategies in 15-20 sections of that course, as well as in other courses. None of the students had previously written journals of any type. Students ranged in age from 18 to 41 (mean = 28 compared to the college mean of 31.2); 93% worked (67% worked full time or more, compared to the college mean of 44%). The average credit load was 8.4 (compared to 7.4). All of the students planned to pursue baccalaureate or graduate degrees (compared to approximately 60% in the college).

Procedure

The Nelson-Denny Test of Reading Comprenension (Form E, 1981 edition) and the Hidden Figures Test, Part 1 (Ekstrom, French, & Harman, 1976) were administered at the end of week three. Six of the students scored at or above the 16.9 grade level (the highest level on the exam) on all three measures: comprehension, vocabulary and total reading. Two read below grade 12.0 (11.8, and 11.1), with comprehension levels of 12 and 9.4, respectively. Two students were very field dependent; two were very field independent.

Students wrote journals on five stories and two plays (weeks 3 - 12). Before they wrote their first graded journal, students received written and oral instructions, in-class practice and feedback, three written descriptions of journal writing processes by former students,

sample journals, and encouragement to view two HyperCard tutorials on journal writing that I had developed specifically for the course.[1] All instructions encouraged students to write any question or comment they thought would help them understand a work better. As incentives, the journals counted 22% of the student's course grade; grading criteria made it difficult for students to earn less than a C on each journal. Following are the instructions in the syllabus.

Write a journal for each story and play, at least a half-page long—but there is no maximum length. Write your journal in ink, using complete sentences—otherwise I will not be able to understand what you are asking or saying. Write any questions you have—except the definition of a word, unless you are unsure of the relevant definition—or any comments you would like to make about the work. The journal is not busy work, but is intended to help me know what you need help with in understanding the story. Write any questions you believe will help you understand the work now as well as later, for the examination—or any other questions you are just curious about. Journals are worth a maximum of 10 points each. If a journal meets the minimum requirements, you will receive 7.5 points—a grade of C; you will receive additional credit, depending on how much your questions and comments indicate that you are paying attention to all the elements as you try to understand the work. There are no *wrong* questions or comments (but there are questions and comments which ignore the details of a work). Journals are a tool for you to learn about what you don't know, not to show me that you already know everything. Even if you don't understand a work at all but ask questions about what you don't understand and indicate that you are paying attention to details, you can receive a 10.

I will collect your journals at the beginning of the class on which they are due. If you miss that class, you may submit your journal at the next class you attend.

I selected and sequenced the stories and plays generally in order of increasing difficulty,[2] using feedback I had received from students over the years. I abandoned my plan to rely on faculty ratings because interrater reliability of stories five faculty were all familiar with varied from -.76 to .88. I also rejected ratings from the Dale-Chall, Fog, Flesch, Flesch-Kincaid, Fry, and Smog reading indices; because they focus on factors such as sentence length and the number of syllables, they are not valid indices for college-level stories and plays, whose difficulty level is more strongly related to plot structure, historical context, and the use of irony, allusion and symbolism (this view was confirmed by two reading teachers at the college).

To establish a baseline for journal writing on a sufficiently challenging work, the first story was one of the most difficult. To examine potential differences in task difficulty after students had developed some expertise in writing journals, I placed the easiest story fourth out of five.

Data were collected throughout the semester in journals, questionnaires, interviews of five students selected to provide insight into many of the variables of interest (age, sex, reading ability, academic major, academic record, and field articulation), standardized tests, course examinations, and field notes (recorded after each class). I collected journals before class discussion of each work, responded in writing, made a copy of each journal, and returned them at the next class. Students completed a written questionnaire about journal writing after their first and last journals; students submitted the latter to my supervisor, with the understanding that I would not see them until I had submitted semester grades.

It is outside the scope of this paper to describe the complete study. Major variables of interest included cognitive activities; reading ability; field articulation; story-difficulty level; semester GPA; length of journals; frequency of questions and comments; topics of questions

and comments; self-ratings of amount learned; and student ratings of journal helpfulness. Qualitative analysis focused on the content of the journals on the stories (particularly the easiest and the hardest story), interviews, and comments in class and on questionnaires. Students' journals were entered in a data base and each main clause was analyzed. After attempts to apply several existing taxonomies, including Bloom's and Gagné's, I developed a taxonomy intuitively (see Table 1). Statistical analyses included Pearson product-moment correlations and ANOVAs.

Results

Following are the most salient findings on the major research questions. (For a complete report, see Cole, 1992; examples of students' questions and comments are also in Cole, 1993.)

A Cognitive Model

No single cognitive model could capture the process within or across journals. Journal writing was a particularly dynamic activity, which students adapted to emergent needs. It appeared to include seven major components (see Fig. 1): identifying a goal, constructing the text base and constructing a situation model (Kintsch, 1989), predicting outcomes, identifying significant elements, reflecting on meaning, reconstructing schema(ta). As students read a story and wrote their journals, these components all appeared to interact with each other as well as with other factors, such as individual learner characteristics and task difficulty (see Fig. 2 and Table 2).

Students engaged in a variety of preparation and execution strategies. For example, all but one generally read a story more than once (up to 10 times); some read a story initially just to get "a feeling for the flow." Some stopped immediately to look up unknown words; some preferred to infer meanings. Some used the "Catechism for Stories," a set of questions on setting, conflict, etc.,[3] almost as a recipe; some, as a heuristic; some never read it. As students gained experience

Table 1. Taxonomy of Students' Journal Entries

1. Correct—i.e., a tenable inference/explanation
2. Incorrect—clearly contradicted by evidence from the story
3. Neither Correct nor Incorrect
4. Statement of Confusion—explicit
5. Question
6. Direct Open Question
An interrogatory sentence that can't be answered "yes" or "no."
Example: Why doesn't the author give us the names of the husband and wife?
7. Direct Closed Question
An interrogatory sentence that can be answered "yes" or "no."
Example: Are they talking about an abortion?
8. Indirect Open Question
An implied question which can't be answered "yes" or "no."
Example: I wonder why he was in this country to begin with.
[Why was he in this country to begin with?]
9. Indirect Closed Question
An implied question which can be answered "yes" or "no."
Example: I think they are talking about an abortion but I'm not sure.
[Are they talking about an abortion?]
10. Item Supporting a Question

11. Reviewing Content (Summarizing/Paraphrasing)
12. Self-explanation
13. Item Supporting a Self-explanation
14. World Knowledge—e.g., "The story takes place in Spain because it mentions Madrid and Barcelona [which are in Spain]." In a looser sense, many of the self-explanations drew upon declarative world knowledge; for example, "The man mentions that he loves the woman he is with, but the woman is never referred to as his wife. So I am going to assume they are not married [because descriptions of married people use terms such as *husband* and *wife*]."
15. Character
16. Says or does
17. Thinks
18. Feels
19. Has a Given Trait
20. Setting—explicit use of the term
21. Point of View—explicit use of the term
22 Theme/Subject—explicit use of the term
23. Protagonist/Antagonist—explicit use of the term
24. Plot Element—explicit use of the terms conflict, crisis, climax, dénouement (These were grouped because there were so few instances of each.)
25. Irony—explicit use of the term
26. Other Elements (e.g., foreshadowing, imagery, plausibility, symbolism, title)
27. Judgment
28. Character's Actions
29. Author's Actions or Story in General
30. What the author did—explicit reference to author
31. Why the author did what he/she did—explicit reference to author
32. Story Difficulty—explicit reference to difficulty
33. Statement of Affect
34. Other (items not classifiable; e.g., statements about the process or the student's life)
35. Story-specific Items

Figure 1. Cognitive Activities Supporting Journal Writing

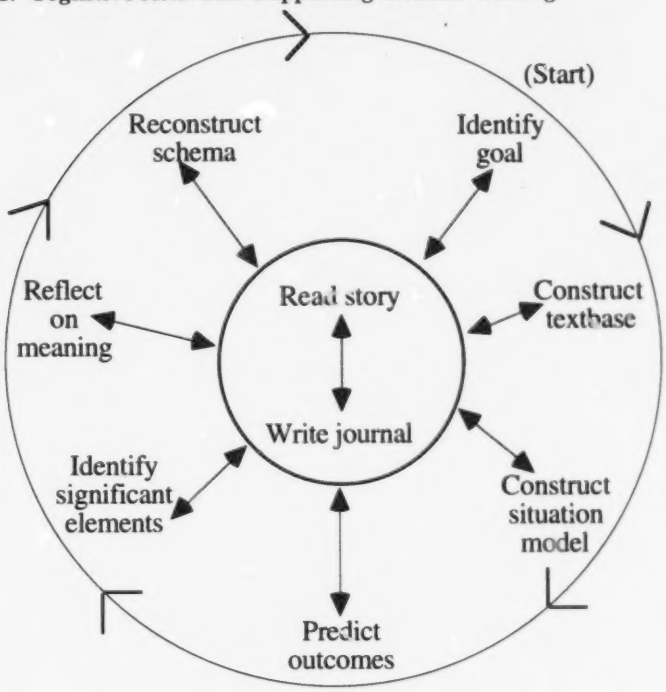

Figure 2. Major Factors Which Influence Journal Writing

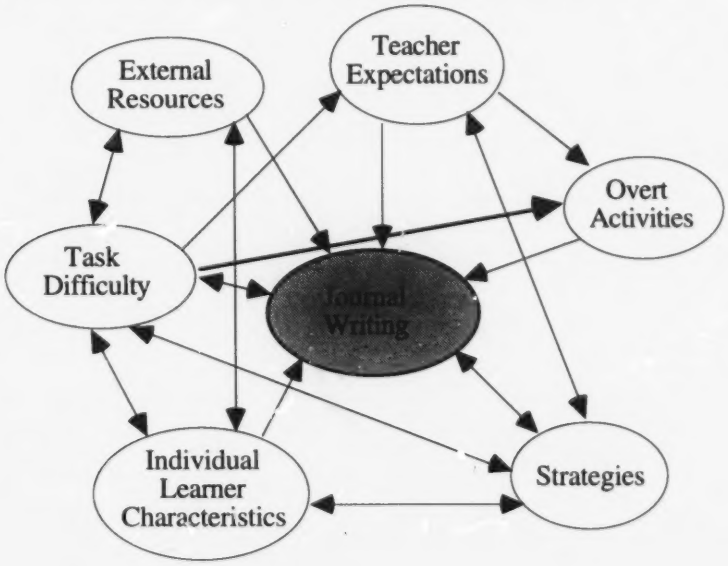

Table 2. Subdivision of Factors Which Influence Journal Writing

I. Overt Activities
- A. Read story.
- B. Write in journal.

II. Strategies/Activities
- A. Metacognitive Strategies/Activities
  - 1. Plan.
  - 2. Execute.
- B. Cognitive Strategies/Activities
  - 1. Review content.
  - 2. Problem solve.
    - a. Ask questions.
    - b. Generate self-explanations.
  - 3. Evaluate.

III. Individual Learner Characteristics
- A. Aptitude
  - 1. Reading ability
    - a. Comprehension
    - b. Vocabulary level
    - c. Reading speed
  - 2. Domain knowledge
  - 3. General world knowledge
  - 4. Metacognitive/Cognitive Ability
- B. Memory Capacity
- C. Field dependence/independence
- D. Motivation
  - 1. Value of the activity to the student
  - 2. Student's confidence in ability to write journals
  - 3. Self-appraisal of ability to understand stories
- E. Understanding of the task (also related to motivation)

IV. Task Difficulty
- A. Frequency of unknown words in the story (from none to many)
- B. Use of conventions of grammar and of fiction (generally uses or disregards)
- C. Amount of irony in the story (from none to much)
- D. Clarify of the situation model (see Kintsch, 1989)
- E. Understanding of journal writing
  - 1. Purpose
  - 2. Criteria
- F. Time available to complete task

V. External Resources
- A. Reference works
  - 1. Dictionaries
  - 2. Encyclopedias
  - 3. Atlases
- B. Literary criticism
  - 1. Articles
  - 2. Books
- C. Other people
  - 1. Fellow students
  - 2. Family
  - 3. Friends/coworkers

VI. Teacher Expectations (Criteria for journal)

In journal writing, they tended to rely less on the "Catechism" as an external guide and instead to be guided by their internal needs. Some said story difficulty influenced their strategies; for example, the best journal writer said she usually took notes as she read but that "Hills Like White Elephants" was so confusing she read it three times before she began taking notes, and then read it seven more times. However, most students generally activated a single procedure that was already in their repertoires. This seemed particularly true of the more field dependent students, who relied on external support in understanding the stories; they generally used a discussion strategy (asked friends or family what they thought the stories meant before they wrote their journals), or used the "Catechism" or adjunct questions to guide their journal writing.

In spite of repeated attempts, it proved impossible to identify the depth of cognitive processing, because journals are only cognitive artifacts, not records of students' thought processes. For example, in an interview, the most astute reader said he didn't really predict outcomes, but automatically ran several possible scenarios through his mind as he read, rejecting scenarios as new details made them untenable; yet he did not describe these activities (or any of the rejected scenarios) in his journals. And if a student wrote "What difference would it make if the setting were changed?," it was impossible to determine if the student was mindlessly copying a question from the "Catechism" or sincerely trying to problem solve.

The use of schemata in constructing meaning. The content of students' journals suggested that they attempted to construct meaning by activating relevant schemata, refining their existing schemata, and/or creating new schemata, as suggested by prior research (Anderson, 1977; Rumelhart & Ortony, 1977). In terms of this theory, when existing schemata readily accommodated story elements, students would not experience any cognitive dissonance (Osborne & Wittrock, 1983; Wilson & Cole, 1991) and therefore would not usually mention those elements in their journals. However, data from interviews and journals suggest that when students' existing schemata did not readily accommodate story elements, most students summarized, generated self-explanations, or asked questions. Furthermore, when students experienced too much cognitive dissonance (e.g., in trying to understand "Hills Like White Elephants"), they resorted to stating their confusion in general terms or blaming the author.

Assimilation theory (Mayer, 1975, 1979, 1980) provides additional insight into the students' use of schemata in problem solving. The theory suggests that meaningful learning (or, in this case, understanding) depends on three conditions: reception of material, and availability and activation of an assimilative context (Mayer, 1980). However, students did not always receive the material; they missed details. Nor did students always have an assimilative context. This was particularly evident in their journals on the most difficult stories. For example, most students did not have a context for assimilating the "operation" in "Hills Like White Elephants," an outdated mode of abortion which is described in the story as "letting the air in." Some students mainly asked questions or expressed confusion instead of trying to generate explanations (e.g., "What type of operation is the girl going to have?" and "The sentence 'It's just to let air in' I do not understand at all!!"—student's punctuation). Generally, however, the journal questions and comments did provide evidence that students were trying to use an assimilative context. In "Hills Like White Elephants," one field dependent reader initially missed the repeated use of the word "operation." In a subsequent reading, having noticed the word, he inferred that "operation" referred to the business operation of the bar at the train station. Later, when he was apparently cued by other students' imposition of a false assimilative context during discussion before class, he

decided the operation was to restore the girl's hearing. By contrast, the best reader generated the following explanation: "The only thing that I can think of that would not really be an operation, that would relieve the [illegible]on or unhappiness that they both apparently feel, would be an abortion."

When readers activate schemata, they r[illegible]e risk of imposing inappropriate schemata (Anderson et al. 1977). This was particularly evident in the journal on "Hills Like White Elephants." Apparently unable to make sense of some key details, several students attended to selective details that fit a schema they could understand; for example, because the girl could not understand the waitress and asked the man to tell her what the waitress said, several students concluded the girl was deaf (see related example in paragraph above). In a slightly different vein, all the students activated an incomplete schema for "white elephants." None of them had additional schemata for a white elephant as something precious which is difficult and expensive to maintain or an endeavor that is a failure.

How are these activities related to individual learner characteristics? The greater the students' expertise in reading, the less they tended to review content (summarize) in the easiest story. This would be expected if the purpose of summarizing/paraphrasing is to help students monitor their comprehension (Palincsar & Brown, 1989). However, on the more difficult stories, some of the best readers used summarizing to scaffold themselves in developing insights.

Students' cognitive activities were not significantly related to students' ratings (a) of journal helpfulness (at the beginning or end of term), (b) of how much they said they had learned about understanding literature, or (c) of the "Student Accounts of Journal Writing" (an instructional resource).

Although the lower achievers (as measured by semester GPA) tended to write as much as the higher achievers, they tended to write more off-task statements, for example, affective statements or statements about the subject or author. (The issue is not whether students engage in off-task behavior, but the extent to which that supplants their engaging in activities that support their achieving the stated goals of the assignment and the course.)

Types of Questions and Comments

An analysis focusing on the hardest and the easiest story revealed that students generally engaged in three types of cognitive activities in their journals: reviewing content (summarizing and paraphrasing), evaluating (making judgments about character actions, author actions, or the story), and problem solving (asking questions and generating self-explanations). The elaborated classification is reminiscent of the strategies "good students routinely bring to the task of studying texts": questioning, clarifying, summarizing, and predicting (Brown & Palincsar, 1989, p. 414). The classification is also suggestive of Chan, Burtis, Scardamalia, and Bereiter's (1992) declarative, interrogatory, and evaluative "response subtypes" (p. 103). However, those two classification schemes relate to what Ng and Bereiter (1991) called "extracting knowledge from text," while constructing meaning from short stories requires interpretation more than extraction.

There were significantly more self-explanations (co[illegible]ments) than questions in each of journals 2 through 5 (Tables 3 and 4). The similar frequencies in the first story may be related to a combination of factors: its brevity (170 words), its difficulty, and students' inexperience at writing journals. Small-to-moderate positive correlations (Table 5) between the frequency of self-explanations in pairs of journals suggests that certain students habitually engaged in generating (many or few) self-explanations, regardless of story difficulty. However, there were no patterns in frequency of questioning and of reviewing content. There was a small significant relationship between question frequency ($r = .613$, p

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< .05) in journals 4 and 5, suggesting that some students might have been developing a habit of generating or not generating questions.

Focus of cognitive activities. Preliminary analyses indicated that students' cognitive activities focused on three categories: (a) the textbase (Kintsch, 1989); (b) the situation model (Kintsch, 1989), which in a literary work involves elements such as setting; characters' actions, thoughts, and feelings; conflict; outcome; and subject, gist, and theme; and (c) literary principles, which might be called the aesthetic model (e.g., why the author included a particular character, and what would be gained or lost by changing the point of view or setting). The majority of cognitive artifacts were attempts to understand the situation model, even in the journals on the easiest story. Students admitted confusion, asked questions, generated self-explanations, judged characters' and authors' actions, and discussed elements that teachers might not point out in class; some also responded affectively. The findings are generally consonant with Wilson's (1989) description of journals in an 11th-grade high school literature class. Most of the students' questions and comments were directly related to the stories, particularly elements relating to character. Students wrote significantly more ($p < .05$) about the story elements (e.g., conflict, crisis, climax, theme) in the easiest than in the hardest story.

Table 3. Mean Numbers of Cognitive Activities in Journals on Stories

Journal	Problem Solving Self-explanations		Questions		Content Reviews	
1 hard*	3.58	(3.87)**	3.58	(3.45)	1.08	
2 easy	10.75[a]	(11.44)	2.83[a]	(2.17)	.25	
3 hardest	10.58[b]	(9.56)	2.83[b]	(3.76)	3.17	(2.67)
4 easiest	12.92[c]	(12.56)	2.33[c]	(4.03)	6.83	(8.21)
5 hard	14.25[d]	(9.49)	3.25[d]	(2.83)	8.58	(6.57)

n = 12 (Only students who completed all 5 journals were included.)
* story difficulty
** Standard deviations are in parentheses.)
a, b, c, d: $p < .05$

Table 4. Effect of Story Difficulty on Average Number of Items in Journals 2 - 5*

	Questions		Self-explanations		
Reading Level	Easy Stories	Hard Stories	Easy Stories	Hard Stories	Total
High Ability (6)	5.00	6.50	23.17	26.83	61.5
Lower Ability (6)	3.33	5.67	24.17	22.83	56.0
Total (12)	10.25[a]		48.50[a]		
Std. Dev.	9.54		38.14		

* For this analysis journal 1 was treated as practice.
$p^a < .001$

Table 5. Correlations of Numbers of Self-Explanations Between Journals

Journal	2	3	4	5
1	.868[a]	.806[a]	.671[b]	.638[b]
2		.742[b]	.576[b]	.649[b]
3			.944[a]	.666[b]
4				.693[b]

n = 12 (Only students who completed all 5 journals were included.)
$p^a < .01$ $p^b < .05$

The role of difficulty level. Story difficulty level was significantly related to only two journal variables: journal length and number of story elements addressed. Students wrote significantly more for the easiest story (fourth) than the hardest story (third). However, this difference might be explained by the fact that students tended to write more as they gained more experience; the average length of the five journals on stories increased steadily: 182.8 (std. dev. 128.2) , 349.7 (328.2), 398.8 (325.2), 539.9 (511.4), 644.5 (327.1). An ANOVA and post hoc analyses revealed significant ($p < .05$) differences between journals 1 and 5 and 1 and 4. More important than the difference in length is the fact that students addressed significantly more story elements (particularly classical plot elements) in their journals on the easiest story than on the hardest. This difference suggests a hierarchical relationship, with construction of the situation model being requisite to identifying all but the simplest plot elements; because most students could not construct the situation model in the hardest story, the only plot element they tried to identify was the setting.

Miyake and Norman (1979) found that on easier material novices asked more questions, but on harder material trained subjects asked more questions than novices. In the current study, because most of the cognitive artifacts in the journals were attempts to understand the situation model, I decided to examine the frequency of questions and self-explanations in terms of reading expertise rather than knowledge of literary principles. Using reading grade level as an index of expertise, analysis did not support these hypotheses (Table 4). This might be explained by the fact that students in the high-ability group all read at or above the 16.9 grade level, but only one or two students in the lower-ability group might truly be described as low-ability, and none could be described as novice readers.

However, several differences between this study and the Miyake-Norman study are worth noting. One of the most important differences is the procedure for identifying questions. In the earlier study, students were asked to verbalize their questions aloud as they studied instructional materials, while in this study students *wrote* their questions and comments, often over the course of several hours or even days; they answered many of their questions before they began to write their journals. Second, "prior knowledge" proved to be a much fuzzier term in this study than in the Miyake-Norman study, where students had a common goal in a well-defined domain (learning three text-editing tasks); thus relevant prior knowledge was clearly defined. In the current study, students were encouraged to adapt a very generalized task to their own needs in an ill-defined domain. Although the long-term goal was to help students develop their skills in understanding stories, they were encouraged to use the journal to address their immediate needs (as *they* defined them) in understanding a given story. Thus, the immediate goal (and perceived relevance of prior knowledge) differed for each student.

Third, several types of prior knowledge played a role in this study, from prior conceptions of journal writing to general world knowledge. I measured students' reading abilities, but I did not attempt to formally measure several other types of prior knowledge, such as students' prior knowledge of fiction (declarative and procedural). Perhaps the most critical prior knowledge was students' general world knowledge, which Anderson et al. (1977) and Brown, Campione, and Day (1981) suggested may be one of the most important factors in students' abilities to comprehend expository prose. General world knowledge would logically seem to play an even greater role in comprehending college-level literature. But there was no way to measure all the general knowledge that directly or indirectly had bearing on the various stories students read. Nor was there a way to identify all the knowledge that might have interfered with understanding a story, with students' assimilating information into inappropriate schemata.

Three additional points are worth noting about the relationship between story difficulty and questions. First, if the point of interest is not *quantity* (number of questions) but *quality* (the type of elements addressed in questions and comments), then this study does provide some evidence of a relationship. Analysis of journal content revealed two qualitative differences. Compared to lower-ability readers, the high-ability readers tended to generate higher-level inferences (e.g., inferring that the operation in "Hills Like White Elephants" was an abortion, and commenting on the *role* of the setting vs. the setting itself), and they tended to address their own questions and points of confusion. Future research should investigate whether these tendencies are related to other factors, such as confidence, willingness to take risks, or knowledge of reading strategies.

Second, students' goal orientations (Ng & Bereiter, 1991) may have been related to the frequency of their questions and self-explanations. This possibility warrants future research, particularly since total student load (academic plus work) correlated negatively with length of journals (e.g., $r = -.681$, $-.675$, and $-.801$ for the last three story journals; $p = < .02$), although average length of journals increased steadily. Third, the higher frequency of self-explanations than questions suggests that they deserve equal attention and that research in ecologically valid contexts should not restrict students to one or the other.

How are questions and comments related to individual learner characteristics? Field articulation and reading ability were the major learner characteristics of interest. As the literature predicted (Jonassen & Grabowski, 1993), there was a significant relationship between scores on the Hidden Figures Test and reading comprehension, vocabulary and total reading levels ($r = .58$, $.59$ and $.57$, respectively, with $p = < .05$). A relationship between reading ability also correlated strongly with semester GPA (e.g., total reading level: $r = .81$, $p = .001$). The reason for the latter must be further explored. Other correlations suggest two possibilities, both of which involve metacognitive skills of planning and execution. The first involves the student's carrying a load (academic and work) too heavy to master with his/her reading ability (and perhaps study skills, etc.). The second involves engaging in off-task behavior that supplanted behavior that was required for mastering objectives (see correlations in research question 2).

Neither reading ability nor field articulation were significantly related to any other major factor. Failure to obtain statistically significant relationships may have been a function of the small sample sizes (less than six field dependent and field independent students). However, tendencies consonant with prior research on field dependence and field independence (Jonassen & Grabowski, 1993) suggest the need to explore several issues with larger sample sizes, particularly since the ability to perceive parts of a whole is essential in the analytical and critical thinking required in the course. Analysis of journal content and in-class comments suggested that field dependent students were less likely than field independent students to perceive key elements/significant details, particularly as story

difficulty increased. Moreover, when they were confused, field dependent students often attended to superficial details and meanings, while field independent students tended to utilize details to help them generate self-explanations. Reflecting a reliance on external guidance and/or a preference for social contexts, the field dependent students also tended to rely on the "Catechism" (and the adjunct questions included in the text for one story) and/or rely on interpretations of family and friends. In contrast, field independent students seemed to attend to internal cues, which allowed them to address their own needs; they either ignored the "Catechism" or used it just "to get my wheels rolling."

Two field dependent students were classic examples of the inability to perceive details. For example, in his journal on "Hills Like White Elephants," Todd said he initially missed the word *operation*, even though it was used several times and was the focus of the story. After he finally noticed the word, he missed other details that would have restricted its meaning, and instead thought that it referred to the business operation of the bar. His journal comments suggest that a discussion before class made him realize that the word referred to a medical operation, but he still failed to identify significant elements of the story that would have helped him correctly identify the operation as an abortion. By contrast, he appeared to be guided by adjunct questions in his journal on the previous story; he addressed three significant issues, all in the order they appeared in adjunct questions.

Taxonomy

A taxonomy (Table 1) can describe students' questions and comments only in very general ways in this ill-defined domain. Having to work with cognitive artifacts made it impossible to determine levels of cognitive processing and to confidently classify all the entries in journals. Students generally did not address the critical elements that are the focus of most instruction and critical analyses. Instead, content of journals reflected intermediate stages of knowledge construction (Bereiter & Scardamalia, 1992) which was highly idiosyncratic. The idiosyncrasy within and across sets of journals is consonant with chaos theory: The sensitive dependence on initial conditions—e.g., learner knowledge—can result in large, unexpected effects—e.g., the specific questions and comments—(Gleick, 1987).

Student Perceptions of Journal Writing

Twelve students evaluated journal writing during the third and thirteenth weeks of the semester, knowing that I would not see their comments until I had submitted course grades. High ratings (mean = 3.9 out of 5 on each; std. dev. = .996 and 1.17) were supported by responses to open-ended questions on the survey, interviews, class comments, and analysis of journal content. In the second evaluation, nine students described the most helpful aspect of journal writing in terms of a cognitive tool (Derry, 1990; Jonassen, 1992). They said it (a) stimulated/facilitated their thinking, including articulating or clarifying thoughts, formulating opinions, examining all of a story's points; (b) forced them to think about what they read, instead of reading passively or just for pleasure; (c) made them look at a work in more than one light; (d) taught them to concentrate or focus thoughts; and (e) forced them to read more carefully, including looking for details. Yet some of the students who rated journal writing most highly said they would not have done it if it had not been required.

How do ratings of journal helpfulness relate to other variables? Ratings were not significantly related to reading ability level, field articulation, average grades on journals, or grades in the course at the time of the survey. Initial ratings of journal helpfulness had a moderate positive correlation with final ratings ($r = .699$, $p = .01$), and a moderate negative correlation with self-ratings of skill in understanding stories at the beginning of the term ($r = -.766$, $p = .01$).[4] At the end of the term the correlation between journal helpfulness and skill in understanding stories had decreased slightly ($r = -.657$, $p = .02$). The findings suggest the

importance in quickly identifying students who rate their understanding of stories highly and helping them discover how to use journal writing as a cognitive tool.

Several other factors significantly correlated with students' ratings of journal helpfulness at the end of the term (see Table 6). For example, the more they thought they had learned, the higher they rated journal writing. The fact that neither journal grades nor course grades correlated significantly with ratings of helpfulness may suggest that students were learning strategies and skills that examinations were not sensitive to (e.g., development of metacognitive strategies). Since no attempt was made to measure learning gains in terms of the material on the examinations, it is possible that students who thought they had learned a lot had indeed done so.

Table 6. Factors Correlated with Ratings of Journal Helpfulness After Last Journal

Factor	r	p
1. self-rating of how much was learned about reading literature	.902	.001
2. rating of helpfulness of journal writing, after first journal	.699	.01
3. academic load	-.680	.02
4. self-rating of skill in understanding stories, beginning of term	-.657	.02
5. improvement in confidence in ability to write journals, last day of term	.640	.02
6. rating of helpfulness of Student Accounts of Journal Writing	.594	.05
7. semester GPA	.588	.05

Summary

Findings indicated that (a) students generally viewed journal writing as a flexible cognitive tool which helped them construct the meaning of stories, and (b) writing journals scaffolds students in attending to details, asking questions, and answering their own questions. Moreover, journal writing is a very dynamic process; no single cognitive model can describe journal writing either within or across students. A two-part model was developed to describe the process: (a) factors which influence journal writing (task difficulty, individual learner characteristics, teacher expectations, student strategies, external resources, overt activities), and (b) components of journal writing (establishing a goal, constructing the textbase, constructing the situation model, predicting outcomes, identifying significant elements, reflecting on meaning, and assembling the schema). Although high-ability readers tended to engage in different cognitive activities than lower-ability readers, frequencies of questions and self-explanations were not related to story difficulty. Students' valuations of journal writing were not significantly related to measures of achievement (course grades, semester grade-point averages, or cumulative grade-point averages).

Discussion

A Flexible Tool

The data from surveys, journals, interviews, and comments suggest that journal writing can be a flexible cognitive tool for a wide range of students in a college Introduction to Literature class. The fact that students of diverse ability and achievement rated journal writing as helpful supports empirical data of Chi, de Leeuw, Chiu, and LaVancher (1991) that high-ability and average-ability students benefit equally from being prompted to generate self-explanations in physics classes.

Although most students said they found journal writing helpful, even students who said they "enjoyed" journal writing did not write optional journals. This might reflect the fact that they had not had enough experience with journal writing to incorporate it into their repertoire of study strategies; Duffy and Roehler (1989) found that high school students needed at least six months of frequent practice with a new strategy. Here, the new strategy

had to compete not only with presumably highly automatized strategies, but also with personality factors (such as self-described "laziness") and demands of work, other courses, and spouse/family. Furthermore, students may have needed guidance in applying journal writing to the study of poetry, which most students find intimidating on its own. Several people have argued that each literary genre requires knowledge of its own conventions (e.g., Culler, 1975; Pressley, Goodchild, Fleet, Zajchowski, & Evans, 1989).

Task orientation. Some students may have had task-completion rather than personal knowledge-building orientations (Ng & Bereiter, 1991). This seems particularly likely for the student who rated journal writing "Not at all Helpful." (Note: This student was not included in many analyses because she missed class the night students took the reading and HFT tests and refused to make them up.) Helping students become "intentional" learners is likely to require more than strategy instruction (Bereiter & Scardamalia, 1989), particularly for adult learners, who have such highly developed schemata for school learning.

Self-explanations and scaffolding. One explanation of the mechanism of self-explanations is provided by Chi and VanLehn (1991), who conjecture that "the act of self-explaining may make the tacit knowledge...more explicit and available for use" (p. 101). Students' open-answer descriptions of the most helpful aspect of journal writing, as well as analyses of journal content, support this interpretation. Relationships between memory capacity, speed of processing, learner ability, and cognitive development may also provide insight into the mechanism by which journal writing appears to scaffold learning. Snow and Swanson (1992) report that higher-ability learners have a larger memory capacity and faster processing speed than do lower-ability learners. Since research shows that memory search speed is critical in associative learning and in forgetting, learning tools, such as journal writing, which focus on reducing the demands on memory capacity and on maintaining attention, should indeed scaffold the learner in constructing meaning.

Students' ability to conceptualize questions. Recently, David Merrill said: "[S]tudents are not good at conceptualizing questions....One of my favorite strategies in class is to say, 'Ask me a question.' Once in a while I get asked a good question, but most of the time I don't. Consequently, I don't think students know what to ask anyway" (Gagné & Merrill, 1991, p. 36). If we expect students to ask the questions that experts would ask, the current study supports Merrill's conclusion—the students asked questions (and generated self-explanations) about few of the elements that experts target as important in the stories. But more importantly this study supports the theory that learners construct intermediate stages of knowledge (Bereiter & Scardamalia, 1992). Students' questions, statements of confusion, and self-explanations provide the data which allow the teacher to adapt the instruction to the needs of individual students as well as the group. Thus, the teacher can work within each student's zone of proximal development (Vygotsky, 1978), helping them develop expertise—ultimately including the ability to conceptualize expert questions. (For an extended discussion of journals as an instructional tool, see Cole, 1993.)

Limitations of question-answering systems. While some people have tried to develop question-answering computer-assisted-instruction programs (e.g., Ferguson, Bareiss, Birnbaum, & Osgood, 1992; Graesser, 1992), these constrain the user to particular questions, expressed in particular language. Such a system (cafeteria-style, natural-language, or hypertext) cannot answer a question which has not been anticipated and incorporated into the database. The range of questions and comments in just 14 students' journals suggests that it would be difficult if not impossible to identify all the questions and misconceptions that can emerge as readers try to comprehend a college-level short story. Because literature is an ill-defined domain (Spiro & Jehng, 1990), the potential number of errors is almost infinite—a factorial function of the number of words, phrases, sentences, and uses of irony, allusions, symbols, etc.

But even if we *could* develop a comprehensive question-answering program for ill defined domains such as Introduction to Literature, the question is whether it is desirable. Helping students become independent learners requires that we encourage them to develop the skills and confidence to identify and solve problems. The positive relationship between students' ratings of journal helpfulness and of how much they learned about literature lends support to this view.

Individualizing instruction. Instructional/learning strategies which encourage students to express their naturally occurring questions and comments allow each learner to build naturally on whatever prior knowledge he/she has, while providing an opportunity for the teacher to monitor the student's comprehension, identify misconceptions, and adjust instruction accordingly. Gaining the type of information provided by journals in ill-defined domains seems to be particularly important when instruction must provide ideational confrontation to facilitate cognitive change (Champagne, Gunstone, & Klopfer, 1985b). In placing the learner at the heart of the instructional process (Resnick, 1983), this study demonstrated how widely learners' questions and self-explanations can vary. Moreover, the wide variation is consonant with chaos theory, which argues that the sensitive dependence on initial conditions—e.g., learner knowledge—can result in large, unexpected effects—e.g., the specific questions and comments—(Gleick, 1987).

Reading comprehension. The current study supports the hypothesis that prior knowledge may be the most critical aspect of learning and problem solving (Anderson et al., 1977; Brown, Campione, & Day, 1981; Novak, 1985; Rigney, 1978; Bereiter & Scardamalia, 1992). Many of the students' comprehension problems related to misconceptions about or lack of world knowledge. The most striking examples of this related to "Hills Like White Elephants." Students thought they knew what a white elephant is (they applied a literal meaning) and thus didn't think to consult the dictionary for additional meanings that might shed critical light on the story. Other comprehension problems related to world knowledge about human motivation, causes of heart disease, European history, roles of men and women at various points in history, representations of Death, etc.

Social or Individual Level of Knowledge Building?

Ng and Bereiter (1991) conjectured that instructional approaches which "promote a 'community of learners' (Brown and Campione, 1990)" would be the most likely ones to foster "personal-knowledge building" (p. 269). For many people, including Ng and Bereiter, a community of learners means having students work in small groups. However, for years people have done collaborative learning but not necessarily with results.

The current study suggests that a *community of learners* might be promoted in ways that do not fit the typical notion of collaborative learning. On one level, journal writing involves a community of two; although I generally respond as a coach, occasionally a student's journal leads me to new insights. On a second level, journal writing involves the whole class (and even former classes) since I draw on journal questions and comments to stimulate class discussion. In class, I model, coach, and scaffold learning, and occasionally students also lead me to new insights.

The mechanism by which students develop their understanding and their ability to answer their own questions seems related to Vygotsky's (1978) concept of mind as society. First, students engage in social dialogue, as part of a community of learners; then, in journal writing, they internalize the type of dialogue that they learned as part of the larger community, while maintaining access to the social dialogue. Journal writing seems to help students expand their own zones of proximal development, making their tacit interpretations explicit and thus available for reflection and analysis. Thus, journal writing can help learners make the transition from being dependent on others to being able to learn

on their own. It helps them move from what Vygotsky (1978) called the *other-directed to self-directed* stages of understanding, a capability that satisfies goals of many educators (e.g., Brown, Campione, & Day, 1981; Duffy & Jonassen, 1992; Frase & Schwartz, 1975; R. M. Gagné, 1980; Jonassen, 1985).

Contributing to one's own understanding. Journal writing gives *each* student the opportunity to ask questions, try to answer them, and express their understanding of a story. A few students do not have the opportunity to come up with all the questions and answers and make it impossible for other students to contribute to their own understanding. (Even if they have the opportunity in class or in collaborative groups, some students don't take advantage of it because they lack confidence or fear peer ridicule.) In describing their Jasper series, the Cognition and Technology Group at Vanderbilt (1992) emphasized the importance of each student having the opportunity to contribute. Journal writing, even more than collaborative learning, guarantees such opportunities.

Recommendations for Research

This study was primarily a qualitative study. Although it suggests that journal writing can be a very flexible cognitive tool, it raised many more questions than it answered. A comprehensive research agenda on journal writing should include at leas the following issues.

Duration (see above). A longitudinal study of journal writing is warranted, preferably a full year of journal writing in more than one discipline, with follow-up studies for at least a year.

Group size constrained the types of statistical analyses as well as the statistical significance of results. Research with a larger group is needed.

Taxonomy. Feathers and White (1987) also found that journal writing by itself is an insufficient means of identifying levels of cognitive/metacognitive activities. Future efforts may have to sacrifice some ecological validity so that research is not constrained by the cognitive artifacts in journals. This might be done by debriefing students. Are the questions real, or do they merely reflect the style of low-confidence (or low-risk-taking) students who are anxious about expressing self-explanations? To what extent did the students generate self-explanations? Did they perhaps apply a generalization about the author from a head note, as some of my students did? Did the students discuss the story? If so, what cognitive activities did they engage in between reading, discussing, and journal writing? Are they reciting a question, self-explanation, or summary provided by another person; applying a concept suggested by another person; or perhaps problem-solving by building on the discussion? However, trying to identify the levels of cognitive processing may require the use of think-aloud protocols (Chi et al. 1989; Chi, de Leeuw, Chiu, & LaVancher, 1991; Chi & Van Lehn, 1991; Hayes & Flower, 1980) and shorter stories.

Achievement. Does journal writing affect achievement? Are there aptitude-treatment-outcomes interactions? Of particular concern is whether students may benefit in ways that are not directly related to stated course goals, especially in long-term development of critical reading, thinking, and metacognitive skills. One caution is important here. If learning involves construction of intermediate stages of knowledge, direct comparisons of journal content with end-of-term content objectives (as suggested by one critic of a manuscript on this topic) is unwarranted.

Transferability and domain. Is journal writing transferable to other educational settings and training contexts as an instructional/learning strategy which benefits teacher and/or student (particularly to situations in which learners have to extract meaning , undergo cognitive change, or solve problems)?

Research has yet to determine whether a journal-writing instructional/ learning strategy is potentially more beneficial in some domains than in others. Related research suggests that it might be. Identifying bugs in well-defined procedural knowledge such as arithmetic seems easier than in ill-defined domains (e.g., Spiro et al. 1988; Spiro & Jehng, 1990) such as understanding philosophy or complex college-level short stories. In arithmetic, computer programs such as J. R. Anderson's (1990) LISP Tutor can even monitor students' actions, intervene, provide guidance, etc. Learning and teaching an ill-defined domain are much more complicated. For example, a complex college-level short story may not have a single "correct" meaning; moreover, the student may have inferred a "correct" or highly tenable meaning from wrong or incomplete evidence. (While a student may also get a correct answer for the wrong reason in arithmetic, it is much easier to identify the error.) Thus the teacher *needs* to know not only the student's conclusion, but also his/her reasoning. While solving arithmetic requires knowledge of a well-defined procedure, understanding a complex story is a dynamic process in which the meaning unfolds with each word, each phrase, each sentence, ... Comprehension is often complicated by the fact that the author of a college-level short story often delays or even withholds information for aesthetic or affective purposes.

Do teacher/instructional methods (e.g., discussion, lecture, discovery learning) affect journal content, learning outcomes, and students' evaluations of journal writing?

On a related issue, I have suggested that adjunct questions and CAI question systems could not adequately anticipate or address students' emergent needs in an ill-defined domain such as Introduction to Literature. However, since journal writing is time-intensive for both student and teacher, research should address whether sets of questions derived from student journals could be incorporated into effective adjunct questions or CAI question systems.

Effects of resources. How does use of resources (e.g., "Catechism for Stories" and the tutorials *Writing Journal Questions* and *Writing Journal Comments*) or discussing stories with others affect the content of journals, learning outcomes, and attitudes? On the final survey, most students said they would have liked more direction in journal writing; yet only one student took advantage of the opportunity to use the tutorials. Should use of such resources be required?

Learner control. To what extent does learner control influence achievement, attitudes, outcomes (e.g., independent learning), etc.? Journals which encourage the learner to identify and try to solve his/her own problems in comprehending an assignment give learners more control than journals which require students to respond to adjunct questions (e.g., Hettich, 1990) or engage in dialectical reasoning about terms which the teacher assigns (e.g., Jolley & Mitchell, 1990).

Metacognitive awareness. Findings suggest that journal writing may have helped develop students' critical reading/thinking skills and metacognitive awareness. For example, one of the students in the class was a 36-year-old woman who read at the 16.9 grade level; she had been in my second-semester composition course, where her probing intellect was evidenced in every essay she wrote. Nevertheless, in one of her last journals in this study, she wrote:

Yes, these journals are a help to me....As much as I read I've never learned to read critically....The point of all this is that I never learned (bothered) to take a story apart and look at it. I've always accidentally picked out a phrase or image that was especially appealing, but now I'm doing it more often, and I'm spending more time contemplating the author's motive, even in my "fun" reading.

Although she was by habit reflective, she had not developed high-level skills to analyze lit

erature. To what extent does journal writing contribute to such changes? What mechanisms are involved? Are there aptitude-treatment interactions?

Effect on class discussion. Several students observed that having to write journals made them think about assignments before they came to class. Does having to write a journal impact the quality and quantity of students' questions and comments during class discussion?

Field articulation. The current study suggests that journal writing may develop the ability to attend to details in learners who are extremely field dependent. Will empirical research support this finding, and if so, with what populations, in what domains, and under what conditions? Would field-dependent learners benefit more by having to respond to adjunct questions to help them focus on salient elements (e.g., a set of story-specific study questions; conflicting accounts of a person, event, or situation; or questions and comments derived from other students' journals)?

Reading strategies. What strategies do high- and lower-ability college readers use in Introduction to Literature, when, and why? How do these relate to journal content, learning outcomes, etc.? Can the strategies of high-ability readers be taught to lower-ability readers? Why do some students attempt to answer questions they ask in journals while others do not? How do differences relate to reading ability, goal orientation, confidence, willingness to take risks, world knowledge, etc.?

Feedback and grading. Do the type and timing of feedback and grading (e.g., rigorous grading vs. no grading; immediate vs. end of term) affect the content of journals, learning outcomes, students' perceptions of journal helpfulness, or their motivation to write journals? (See Cole, 1992, for discussion of these issues.)

Role of world knowledge. As discussed above, many have hypothesized that world knowledge plays a dominant role in comprehending expository prose. Findings in this study suggest that world knowledge also plays a dominant role in college students' comprehension of complex short stories. How can relevant world knowledge be identified and measured? What instructional strategies are most effective for providing world knowledge which is relevant to a given story (e.g., isolated teaching of knowledge before students read a story, footnote or marginal glosses, hypermedia programs to provide access to relevant knowledge on demand, or class discussion after students have read a story)? Are there aptitude-treatment interactions?

This paper has described journal writing as a dynamic and flexible tool that is valued by learners of diverse abilities. However, much research is needed before we have a clear understanding of the constraints which must inform instructional prescriptions for journal writing.

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[1]Since I provide written and oral instruction and practice in class, the main purpose of the tutorials in my classes is to increase students' confidence in their ability to write productive journals by providing opportunity for review, additional practice and feedback (particularly by allowing students to compare their practice entries to a wide range of responses from former students). The tutorials—*Writing Journal Questions* and *Writing Journal Comments*—identify the purposes and criteria of the types of journals assigned, and provide practice identifying productive journal responses, and practice writing responses to excerpts from stories. They also explain and illustrate many types of journal entries (e.g., state the effect of the story on the reader, paraphrase, summarize, predict, verify, relate story events to personal experience).

[2]The five stories were sequenced: (1) "Appointment in Samarra," anonymous; (2) "Story of an Hour," Kate Chopin; (3) "Hills Like White Elephants," Ernest Hemingway; (4) "Cathedral," Raymond Carver; (5) "The Cask of Amontiilado," Edgar Allan Poe. Student feedback suggests that 2 and 4 are easiest to comprehend (4 being easier than 2) and that 3 is the most difficult.

[3]The "Catechism for Stories" also includes questions on atmosphere, character, point of view, crisis, climax, resolution, tone and theme (and related questions on keywords, subject, plot, and symbols). Following are the questions relating to "crisis":

a. At what point (scene or moment) can things get better or worse for the protagonist? (Often this is at the point of climax.)
b. What was the situation before this point?
c. What choices are involved?
d. What are the potential consequences?

[4]Occasionally I have had students with graduate-level understanding of literature; they have been the best journal writers. None of the students in this study had such an understanding.